

## CLAIMS

What is claimed is:

1 1. An integrated optical isolator device, comprising:  
2 a planar optical substrate;  
3 a first waveguide formed in said optical substrate and having an input  
4 section and an output section; and  
5 an isolator element affixed to said optical substrate and positioned in an  
6 optical path of said first waveguide between said input section and said output  
7 section, said isolator element being configured to allow the passage of forwardly  
8 traveling light from said input section to said output section of said first  
9 waveguide while inhibiting the passage of backwardly traveling light from said  
10 output section to said input section.

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1 2. The device of claim 1, further comprising a trench formed in said optical  
2 substrate, said trench being oriented transversely with respect to a longitudinal  
3 axis of said first waveguide, and wherein said trench receives and holds a lower  
4 end of said isolator element.

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1 3. The device of claim 1, further comprising a second waveguide formed in said  
2 optical substrate and having an input section and an output section, and wherein  
3 said optical isolator element is further positioned in an optical path of said  
4 second waveguide between said input section and said output section of said  
5 second waveguide.

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1 4. The device of claim 1, wherein said isolator element comprises at least one  
2 Faraday rotator layer interposed between birefringent layers.

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- 1 5. The device of claim 1, wherein said input section includes a first taper section  
2 for expanding forwardly traveling light from a first mode size to a second mode  
3 size.  
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- 1 6. The device of claim 1, wherein said first taper section is substantially  
2 adiabatic.  
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- 1 7. The device of claim 5, wherein said output section includes a second taper  
2 section for contracting forwardly traveling light from said second mode size to a  
3 third mode size.  
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- 1 8. The device of claim 1, wherein a long axis of said isolator element is oriented  
2 perpendicular to an optical axis of said first waveguide.  
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- 1 9. The device of claim 2, wherein said trench extends partially through a  
2 thickness of said optical substrate.  
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- 1 10. The device of claim 2, wherein said optical substrate is affixed to an  
2 underlying support substrate, and said trench extends fully through a thickness  
3 of said optical substrate and partially into a thickness of said support substrate.  
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- 1 11. The device of claim 1, wherein said first waveguide has an associated mode  
2 center located at least 30 microns below an upper major surface of said optical  
3 substrate.  
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- 1 12. The device of claim 1, wherein said input and output sections of said first  
2 waveguide are formed simultaneously in said optical substrate.  
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- 1 13. The device of claim 1, wherein said optical substrate is formed from a glass.

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1 14. The device of claim 1, wherein said first waveguide is formed by field  
2 assisted ion-exchange.

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1 15. The device of claim 2, wherein said planar optical substrate comprises  
2 separate first and second pieces, said input section being formed in said first  
3 piece and said output section being formed in said second piece, said first and  
4 second pieces being spaced apart across a gap, and said isolator element being  
5 disposed at least partially within said gap.

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1 16. The device of claim 15, wherein said first and second pieces are affixed to a  
2 common support substrate.

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1 17. An integrated optical isolator array, comprising:  
2 a planar optical substrate;  
3 a plurality of waveguides formed in said optical substrate, each one of the  
4 plurality of waveguides having an input section and an output section; and  
5 an isolator element affixed to said optical substrate and positioned in the  
6 optical paths of at least two of said waveguides between said input sections and  
7 said output sections, said isolator element being configured to allow the passage  
8 of forwardly traveling light from said input sections to said output sections of  
9 said at least two waveguides while inhibiting the passage of backwardly  
10 traveling light from said output sections to said input sections.

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1 18. The integrated optical isolator array of claim 17, further comprising a trench  
2 formed in said optical substrate, said trench being oriented transversely with  
3 respect to the longitudinal axes of said plurality of waveguides, and wherein said  
4 trench receives and holds a lower end of said isolator element.

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- 1 19. The integrated optical isolator array of claim 17, wherein said isolator  
2 element is positioned in the optical paths of all of said plurality of waveguides.  
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- 1 20. The integrated optical isolator array of claim 17, wherein said isolator  
2 element comprises at least one Faraday rotator layer interposed between  
3 birefringent layers.  
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- 1 21. The integrated optical isolator array of claim 17, wherein said input sections  
2 each include a first taper section for expanding forwardly traveling light from a  
3 first mode size to a second mode size.  
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- 1 22. The integrated optical isolator array of claim 21, wherein said first taper  
2 section is substantially adiabatic.  
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- 1 23. The integrated optical isolator array of claim 21, wherein each of said  
2 output sections includes a second taper section for contracting forwardly  
3 traveling light from said second mode size to a third mode size.  
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- 1 24. The integrated optical isolator array of claim 17, wherein a long axis of said  
2 isolator element is oriented perpendicular to the optical axes of said plurality of  
3 waveguides.  
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- 1 25. The integrated optical isolator array of claim 18, wherein said trench extends  
2 partially through a thickness of said optical substrate.  
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- 1 26. The integrated optical isolator array of claim 18, wherein said optical  
2 substrate is affixed to an underlying support substrate, and said trench extends  
3 fully through a thickness of said optical substrate and partially into a thickness of  
4 said support substrate.

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1 27. The integrated optical isolator array of claim 17, wherein said input and  
2 output sections of said plurality of waveguides are formed simultaneously in  
3 said optical substrate.

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1 28. The integrated optical isolator array of claim 17, wherein said optical  
2 substrate is formed from a glass.

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1 29. The integrated optical isolator array of claim 18, wherein said planar optical  
2 substrate comprises separate first and second pieces, said input section being  
3 formed in said first piece and said output section being formed in said second  
4 piece, said first and second pieces being spaced apart across a gap, and said  
5 isolator element being disposed at least partially within said gap.

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1 30. The integrated optical isolator array of claim 29, wherein said first and  
2 second pieces are affixed to a common support substrate.